Research Paper

How AI has impacted various fields of work

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Abstract:
Artificial Intelligence (AI) is a technology that enables machines to imitate human intelligence and display complex problem-solving capabilities. Data science, machine learning, deep learning, natural language processing and computer vision are few of the domains of AI at the forefront of technological revolution. The future goals for AI is to replace repetitive tasks in various industries and hone the skills of people towards more creative and innovative tasks. However, deployment of AI has to overcome various obstacles of ethical consideration such as eliminating bias, discrimination and privacy. This study explores the emergence and development of AI over the years along with what it is set to do in the future, consequently its predicted impact on various fields of work such as Healthcare , Education, legal sector and the IT sector. It also discusses challenges that AI has to overcome to ensure its mass scale deployment and finally, the overall growth of AI in the future.

I.   Introduction

Emergence and development of AI:
In 1950 Alan Turing published his theory of computational thinking which led to the Turing test ultimately giving birth to Artificial intelligence, making him one of the first people to seriously research the possibility of machine intelligence.

The **1950s** witnessed the development of the first AI programs capable of playing checkers and solving algebra problems.

The **1960s** and **70s** are often referred to as the golden years of AI, characterized by significant funding, enthusiasm, and groundbreaking research.

From the **70s** to **80s** was a period of dormancy in the growth of the AI sector due to its high cost, lack of practical applications, inability to scale and limited funding.

The **1990s** served as a revival period for this sector as the availability of data increased, machine learning deeply served as major driving mechanisms for this sector. This period set the stage for the modern era of AI.

In the **21st century**, AI has become an integral part of our daily lives. This era has witnessed AI breakthroughs in fields like healthcare, finance, and autonomous vehicles. The integration of AI with other technologies like the Internet of Things (IoT) and big data analytics has further expanded its capabilities and applications, making it a cornerstone of the current technological landscape.

Not more than a decade ago was AI considered to be a mere gist of developing ideas with potential, when humans were considered far more capable than a machine. But within a short span of time the tables have turned. Now winning a rock paper scissor game against an AI machine is considered to be an achievement. One of the recent AI developments was Japan's proactive step by initiating a program focused on utilizing androids to provide care for the country's aging population, recognizing the anticipated shortage of labor in the future.
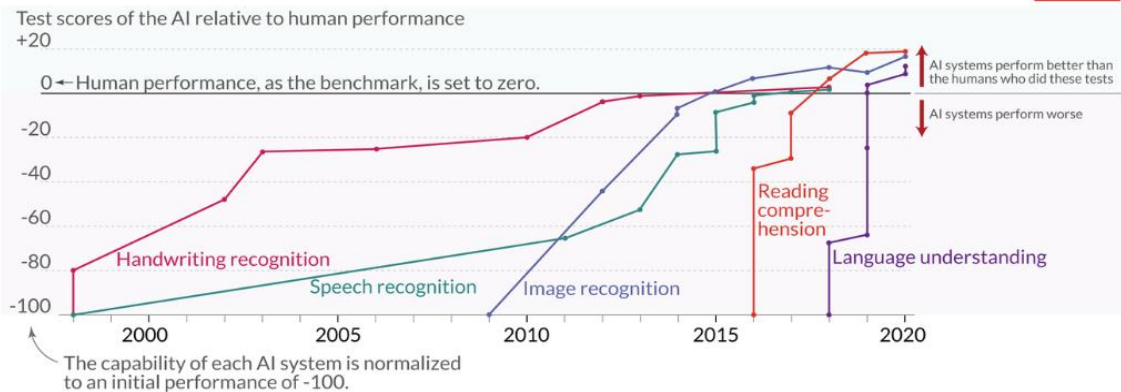
Just 10 years ago, no machine could reliably provide language or image recognition at a human level. But, as the chart shows, AI systems have become steadily more capable and are now beating humans in tests in all these domains.

Seeing the rapid progress AI has made over the previous years, it is safe to say that this trend will only continue if not accelerate, rendering the machines more and more capable of performing human-like tasks leaving people unemployed or in worst case scenario complete automation of a field of the job sector. However, on the positive side, AI can help less experienced workers enhance their productivity more quickly thereby increasing the value of work. According to the World Economic Forum, 85 million jobs would be lost to AI worldwide by 2025. Furthermore, according to the organization's "The Future of Jobs Report 2020," technology will add 97 million new jobs over the next few years.

The Mechanism behind AI

Google had developed a chess game between 2 players both of which were AI generated except that one of them was programmed with a complicated set of rules and instructions for playing chess while the other one, Alpha zero was given basic inputs. And the results were surprising, Alpha zero won chess games which left the scientist wondering. It was because Alpha Zero had watched and observed enough games to actually understand what winning looks like as a result it adapted to the strategies of winning the game pretty quickly. That was the first indication of generative technologies moving from algorithms to learning. Google CEO Sundar Pichai claimed that artificial intelligence (AI) would be more transformative to humanity as a species than electricity and fire. Such rapid progress in the capabilities of AI systems is predictably driven by progress in three inputs—compute, data, and algorithms. Much of the progress of the last 70 years has been a result of researchers training their AI systems using greater computational processing power, often referred to as "compute", feeding the systems more data, or coming up with algorithmic hacks that effectively decrease the amount of compute or data needed to get the same results. It trains on more and more data to give recommendations to users according to user history and preference in apps like Netflix and Instagram. The ability of AI to improve itself over time without explicit programming and adapt to new situations makes it different from traditional technologies, making AI autonomous i.e..it can act on its own without human intervention. This ideology often forms the basis for numerous AI fiction movies.

How systems used to be trained   How systems trained with machine learning
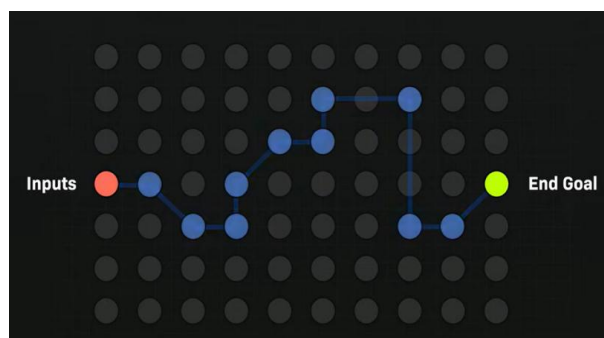
What is AI targeted to do

A recent report from Goldman Sachs estimates around 300 million jobs could be affected by generative AI, meaning **18% of work globally could be automated**—with more advanced economies heavily impacted than emerging markets.

According to the report, jobs in agriculture, mining and manufacturing are the least exposed to generative AI, while jobs in the information processing industries, like IT, are the most exposed because jobs that use "programming and writing skills" are more closely related to GPT's capabilities.
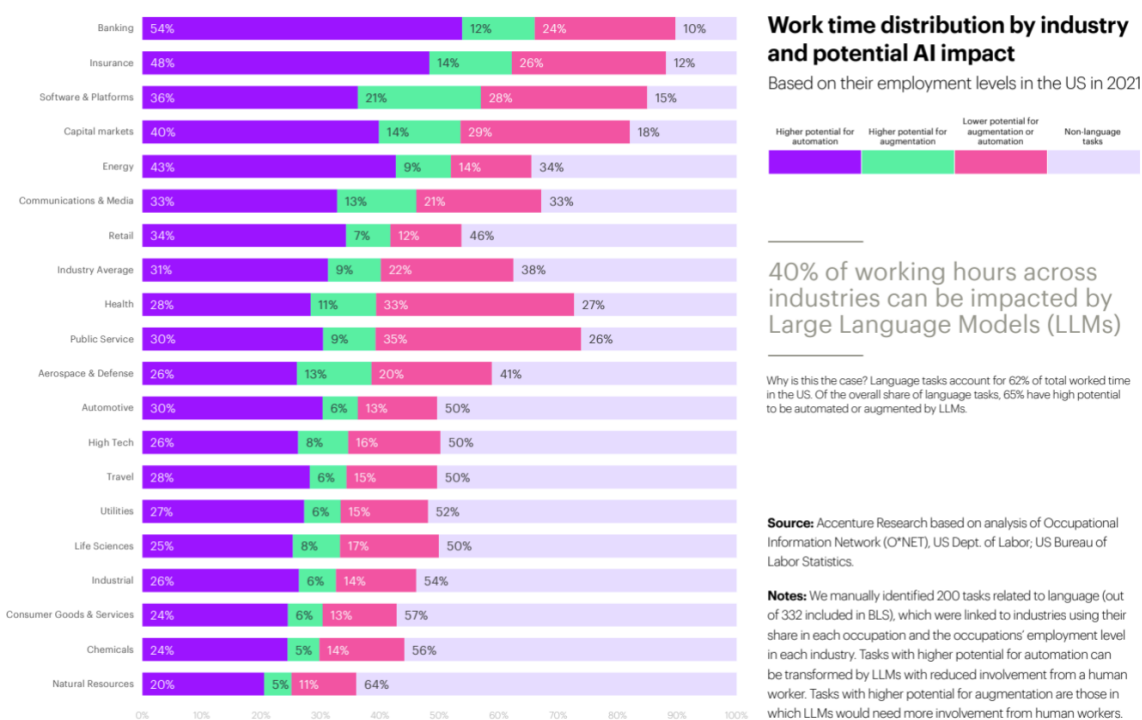
The global artificial intelligence (AI) market size was valued at USD 454.12 billion in 2022 and is expected to hit around USD 2,575.16 billion by 2032, progressing with a compound annual growth rate of 19% from 2023 to 2032
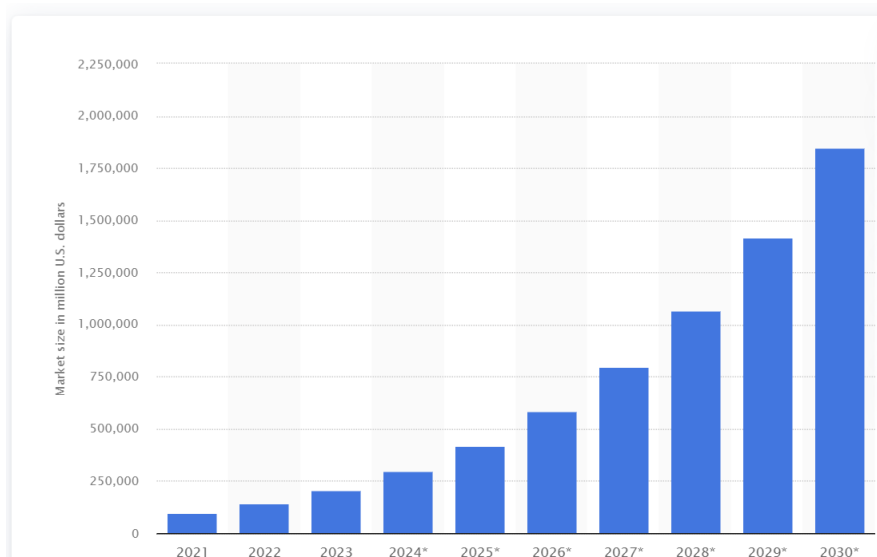
Many secretarial and clerical roles such as bank tellers, customer service roles, bookkeeping and data entry clerks are expected to dwindle overtime as automation percolates into these industries. In fact many airports around the world such as Heathrow and Gatvik are now installing AI and switching to e-services where travelers can do automatic baggage check-ins and self-driving vehicles with minimum human intervention. However, the bright side is that there will be an increase in jobs like AI and machine learning specialists, data analysts and scientists, and digital transformation specialists. Sectors of Healthcare, Education, security and surveillance, industry and energy sectors will be some of the most impacted by the rapid advent of AI. On the other hand, creative sectors involving social skills, interpersonal relations and emotional connection such as artists, writers, actors, social media influencers, musicians and designers are going to be the least impacted by AI, as they provide people a sense of humane reality in a world of rapid automation. Contradictorily, though, AI's ability of portraying images with hyperrealism such that it becomes almost impossible to identify whether the person/object in the image is AI generated or not could potentially pose security threats and affect the career of many artists as well.

The World Economic Forum published a graph showing the real time impact of generative AI in various fields of work

Figure 3: Generative AI will transform work across industries

Work time distribution by industry and potential AI impact

Based on their employment levels in the US in 2021

40% of working hours across industries can be impacted by Large Language Models (LLMs)

Why is this the case? Language tasks account for 62% of total worked time in the US. Of the overall share of language tasks, 65% have high potential to be automated or augmented by LLMs.

Source: Accenture Research based on analysis of Occupational Information Network (O*NET), US Dept. of Labor; US Bureau of Labor Statistics.

Notes: We manually identified 200 tasks related to language (out of 332 included in BLS), which were linked to industries using their share in each occupation and the occupations' employment level in each industry. Tasks with higher potential for automation can be transformed by LLMs with reduced involvement from a human worker. Tasks with higher potential for augmentation are those in which LLMs would need more involvement from human workers.

How AI will impact various professions

1. Healthcare

The Healthcare sector is one that is expected to be the most revolutionized with the entry of AI.

An Oxford University report predicts medical transcriptionists, medical records, medical secretaries and health information technicians are the most likely jobs in the field to be automated improving treatment efficacy and speeding up diagnosis, not actual providers. While AI will not overtake the role of doctors and physicians, it will not leave this sector completely chaste either. Medical fields like that of radiology will benefit from the automated image analysis, application of AI algorithms in tissue analysis and many more. AI can help perform complicated genetic engineering processes and potentially discover cures for diseases like Alzheimers which scientists have been working on for more than 50 years with no clear answer.

Here are a few of the AI driven technologies deployed in the medical field:

1.1. Medical Image Analysis:

Convolutional Neural Networks (CNNs) is a deep learning architecture used for image processing. They are used in detection of brain tumors and other conditions from CT scans and X-rays. CNNs analyze images and extract features that they can use to classify images into categories. They extract hierarchical features from images and detect patterns like textures and edges.

1.2. Surgical Assistant Robots

These AI automated robots are designed to enhance surgical procedures including minimally invasive and orthopedic surgeries by assisting doctors and reduce potential medical errors and speed up the surgeries. Modular robots, such as therapeutic exoskeleton robots and prosthetic limbs, support rehabilitation efforts for patients with issues related to stroke, paralysis, traumatic brain injury, and multiple sclerosis. These robots can be used to monitor a patient's form as they perform exercises, measure degrees of motion, and track progress. SARs are usually used with surgeries that involve minimal incisions and allow doctors to ensure accuracy while maneuvering through the complexities of the surgery.

1.3. Speeding up Drug Discovery

Through its deep learning algorithms, AI can analyze intricate and vast genomic and proteomic clinical datasets to identify potential targets accurately. For instance structure based drug design is one such technology used by an AI operated platform to learn more about drug molecules' interactions with targets to increase the precision of the drug development process.

Granted all the boons of AI, it will not be replacing doctors and nurses in providing intensive all around the clock care for their patients but most definitely assist them to reduce human error, increase accuracy of prediction of diseases, speed up decision making and treatment duration and lead to discoveries of cures for untreatable diseases. Mechanical work like billing and registration will be automated that might lead to a decrease in demand of medical transcriptionists and billing specialists.

2. The Legal sector

In 2018 Harvard Law School published an article stating that "Within a few years, AI will be taking over a significant amount of work now done by lawyers. 39% of in-house counsel expect that AI will be commonplace in legal work within ten years." Automation will be observed in management of large volumes of documents or to find categories of clauses in documents. Countries like the US, Germany, the UK, Australia and China are some of the first countries to deploy AI in their legal frameworks. China has deployed more than 100 robots in its legal systems that assist in retrieving case histories and past verdicts and reducing the workload of officials. However "The application of artificial intelligence in the judicial realm can provide judges with splendid resources, but it can't take the place of the judges' expertise," said Zhou Qiang, the head of the Supreme People's Court, who advocates smart systems. In 2018 law firms were using AI tools for e-disclosure, legal research, digital dictation, automating practice management systems and chatbot style tools to offer basic assistance for clients. While AI can assist in gathering evidence, searching for records and improving the transparency and accuracy of facts presented, the replacement of judges and lawyers with fully autonomous judges and lawyers is still under speculation and most likely not practical as of now due to reasons like potential bias and discrimination. At the end of the day I can only operate based on the data fed by humans. If that data is incorrect or biased it will be replicated by the machine during the decision making process. For instance, Amazon's AI recruiting system had an inherent bias. Despite the progress, women are still underrepresented in STEM, due to this the AI system thought that male applicants were consciously preferred during this evaluation of the resumes giving women resumes lower rating. Similarly if AI is fed with data that is disproportionate towards a particular group, it will emit bias against them.
Hence, AI can revolutionize this sector in terms of its efficiency and management but it still has loopholes that need to be addressed and fixed.

3. IT sector

Automation is the primary way the IT industry is going to be affected by AI. By automating complicated processes using AI powered softwares, industries can save time, increase efficiency and decrease possibility of human error. AI powered chatbots can take customer inquiries and AI can automate software testing and deployment as well. Security is another aspect that can be refined with the involvement of AI, by automatically identifying potential threats and analyzing network traffic to allow for precautionary measures and actions to be in place before the damage is done. AI can be used to analyze the huge amount of data running through the IT businesses to recognize user patterns and lead to the curation of more user preference catered updates and softwares. In the future it is expected that advanced AI systems will be able to run and manage the software development cycle by itself, understanding the core of the code. Such application of AI operated softwares in the industry can aid in freeing up IT experts to focus on more value added activities. AI-powered software testing tools can execute test cases, identify bugs, and generate reports, significantly streamlining the software development process. In the process of AI integration IT professionals would have to adapt to this new age to stay relevant as a result constant learning on how to leverage AI tools and augment their abilities to improve their work process is crucial. As AI continues to drive innovation in this sector it will redefine roles and create new opportunities providing the end users with the best of services as a result professionals will need to shift to different roles in collaboration with AI to identify the needs of the stakeholders.

4. Education:

The Education sector is heavily affected with the rapid progress of AI which has become quite evident especially after the launch of Chat GPT. Students are able to access personalized learning, improved accessibility and feasibility are just some of the many ways AI has transformed this sector.

1. Personalized learning
AI provides adaptive material, analytical tools and engaging experiences catered to the needs and preferences of each individual student ensuring a holistic and paced learning process. Popular language learning platforms like

Duolingo have improved its learning performance by integrating AI in its learning technology. Using its machine learning technology- BirdBrain, it can predict the probability of getting the question wrong and can adjust the difficulty level according to each learner. It uses the BLAME algorithm to find out where the user went wrong in an exercise and pinpoint the exact area so that the user can improve on it later.

2.   Virtual Teaching Assistants and Chatbots

AI driven chatbots can make students more confident in managing their workload and navigating coursework efficiently. TA Pounce, an AI driven software reminds students of their upcoming assignments, manages their schedule and encourages them to use various academic sources at the school. While the chatbot does look after the administrative things and provide practical solutions, human involvement is still needed to make ethical decisions. By assigning all the administrative work to the chatbots the educators can free up their valuable time and devote it to student engagement. Using chatbots to ask one question on the topic, give ethical dilemmas, provide critique on teams ideas etc.. can stimulate innovation and fresh ideas in the learning environment

3.   Automated grading and assessment

AI's ability to detect plagiarism, analyze text and score answers is nothing short of transformative in the education system as it has taken a huge burden off of the teachers and professors. One significant advantage of AI grading is its consistency. It doesn't get fatigued or biased, ensuring that every student is assessed fairly. The time frame in which AI gets the grading job done is another salient advantage as it would take humans hours to grade a batch of numerous students. Thus timely feedback, unbiased grading and consistent scoring are some of the crucial elements fulfilled by AI driven softwares.

Challenges and Opportunities:

There are still several obstacles that AI has to overcome to ensureit's mass scale and efficient deployment. Solving these challenges calls for interdisciplinary cooperation and defining regulatory policies. The growth of AI will result in concerns of bias, privacy, security and ethical concerns.

1. AI bias: When discriminatory data and algorithms are fed to the AI systems they emit bias. It may be due to incomplete data or data that does not represent reality. Bias infiltration cannot be detected easily, as it might not occur during the model's construction and even if it is rectified there is no guarantee of its complete removal from the system. For instance, amazon's bias in the recruitment process continued even after the system was revised and rectified as the revised system was still picking on implicitly gendered words which were highly correlated with man over woman. Open source data science can help address bias as opening the code to a community of developers can provide the model with more and more data to train on, making high quality resources accessible to larger community and data scientists thereby creating robust solutions and a more inclusive and representative model.

2. AI and privacy: AI systems depend upon a large amount of data to perform the function it's designed for. Naturally there is a growing concern towards the online privacy of users and the safety of their confidential data. There are risks of data breach and unauthorized access of sensitive information that could lead to hacking. The privacy challenges posed by AI systems are far more complex than those by traditional data processing systems as AI trains on exponentially more and diverse data which makes data management and data security a crucial element especially in sectors like Banking, Financial sectors and for that matter even web surfing. Having strict privacy rules and policies in place and ensuring that all AI systems follow it is extremely salient. Transparent data usage policies, secure data storage and data anonymization which involves removing personal information from a dataset. Pseudonymization is replacing identifiable information with artificial identifiers and encryption can be used to secure data by converting it into secret code that can be accessed only by authorities. All these practices can enhance privacy and ensure safe usage of private data.

3. AI ethics: AI ethics are a set of principles that stakeholders use to ensure safe usage of AI and prevent any irresponsible use of AI. AI ethics address a wide array of issues from data privacy, bias, discrimination, social impact and transparency. The goal of these ethics is to ensure that AI is beneficial to society and does not violate human rights. As AI is being trained more and more to be human and even advance beyond in terms of thinking and capabilities, the same judgements that cloud the human mind can seep into technology making these ethics crucial.

II. Conclusion

Forbes says that according to an MIT and Boston University report, AI will replace as many as two million manufacturing workers by 2025 and 14% of employees globally would have to change their career paths to adapt to the rising automation in each field. One hand, AI will replace many of the administrative and repetitive mechanical tasks of customer service representatives, receptionists, salesperson while on the other the progress of AI will also lead to the creation of new jobs in this vast field such as Data curators, AI model and engineers, Ethics and governance specialists and Interface Designers that will maneuver the functioning and expansion of AI in various fields. Simultaneously, professions of doctors, lawyers, judges, teachers, HR managers and that of creative professionals will remain intact and enhanced with the support of AI. The development of AI since the past decade has been rapid yet we have quite a long way to go for mass deployment of AI professionals in various fields. Wrapping one's head around this massive change that is occurring at a fairly fast pace requires one to understand AI and its capabilities and adapt to its real life implications. Instead of viewing AI as something that would replace humans, a new perspective would be viewing AI as Augmented Intelligence that works alongside humans to improve their work. By integration of AI humanity could reach new heights and become an unstoppable force of creativity.

Acknowledgement:

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